Dr. B.B. Sarkar, the author of this article has within the confines of space for an article dealt with exhaustively the bamboo cultivation technology for North-eastern Region. As the author has remarked, “Bamboo is a versatile group of plants capable of providing ecological, economic and livelihood security to the people of the North-eastern States.” Besides, about 28 per cent of bamboo resources of the country are in the North-east Region. The versatile uses of bamboo renders it the potential to become the backbone of the rural economy of the North-eastern Region.

A.A.

Bamboo Cultivation Technology for North Eastern Region

Dr. B.B.Sarkar

Bamboo is a versatile group of plants capable of providing ecological, economic and livelihood security to the people of the North-eastern States. About 28% of bamboo resources of the country are in the North-east Region. Out of the total forest area, about 12.8% is under bamboo, and 2/3rd of the growing bamboo stock is located in the North-eastern States. Bamboo is an important non-timber forest produce of the North-eastern Region of India. About 60 species of bamboo grow in the natural forests and in the homestead plantations in plain rural areas. The livelihood of the tribal people of the North-eastern states mainly depends on bamboo. Bamboo shoots are a delicious food for the majority of the people of the North-eastern states. The tribals in hilly areas and people in the rural plain areas earn their livelihood through selling bamboo culms and shoots as well as incense sticks and other industrial products made out of bamboo. The versatile uses of bamboo has made it the backbone of the rural economy of the North-eastern Region.
Bamboo Forest

Why Bamboo?

1) Bamboo for food, clothing and shelter.
2) Substitute for timber.
3) Thrives in all types of soils and seasons.
4) Livelihood of the poor people.
5) Helps in soil conservation.
6) Neutralizes acid soil.
7) Increases water capture and recharge.
8) Reduces siltation of rivers and reservoirs.
9) Helps in reducing global warming and mitigating its impact.
10) Renewable source of energy.
11) Protects water courses, streams and rivers.
12) Aids biodiversity conservation.
13) Increases soil fertility.
14) Helps in preservation of Tribal Culture and Heritage.
15) Aids employment generation.
16) Aids treatment of waste land, waste water, prevents landslides.
17) Raw material of industry.
18) Promotes good environment.
19) Short duration plantation crop.
20) Less labour intensive farming.
21) Medicinal use.
22) Musical instrument made out of it.
23) High bio-mass production (30-50 MT per hectare)
24) High Carbon absorption potential
25) Acts as wind break
26) Cultivation technology and maintenance of plantation is very easy.
27) Shorter gestation period than other plantation crop (less than 4 years)
28) Fast growing plant (growth rate above 30 cm per day)
29) Bamboo can provide fast vegetative cover to deforested areas.

Selection of land:

Different species of bamboo are found to grow in all types of soil of the hilly states of North-east India. In the North-eastern Region bamboo grows on hilltop, sloppy area of hill and nearby river, cherra, ponds, watershed area, roadside and fallow land in plain area. The bamboo plant grows well in alluvial and red soil with large content of organic manure. Moreover, bamboo cultivation is favourable in acid and natural soil. During selection of land for bamboo cultivation, high land with well drained soil is preferable.

Land preparation and layout:

First of all the selected plot should be clean and free from weeds, jungle, etc. All the dry stubbles are to be burned in the selected plots as the ashes are the source of manure. In plain land, plots are to be made ready by cross ploughing followed by laddering. In hill areas preparation of land is to be done by spading. The roots of the weeds should be uprooted by spading so that the growing of unwanted plants can be avoided from the next time. Preparation of land is to be completed in the month of March-April with layout according to the species of bamboo. Along with this, digging of pits, application of manure, etc. should also proceed apace. The size of the pits will vary according to the use of seedlings, rhizome, branch cutting and culm cutting, etc. For example, pit size of seedlings, branch cutting will be 40 cm X 30 cm X 30 cm and 30 cm X 25 cm X 25 cm for seed, 45 cm X 35 cm X 35 cm for culms cuttings layering and 75 cm X 60 cm X 60 cm for rhizomes.

According to the species of the bamboo, the size of the pits will be small and big. The pits should be dug in such a way that the top layer of the soil is to be kept at one side and the other part, i.e., lower layers’ soil in another side. The top soil is to be mixed with 5 kg compost and ashes, 100 gm Rock
Phosphate and 50 gms Murite of potash, and the pit should be filled up with the mixed soil. If necessary, a mixture of 8 ml chloropyriphos 20 EC with 1 litre of water should be sprayed in termite infested areas. During the monsoon, bamboo plants are damaged due to stagnation of rain water in the pits. In low plain areas, bamboo cultivation is to be done by bund and trench method. In this method, a bund of 1 metre breadth and 50 cm height is to be prepared in low lying plain land. The length of the bund will be according to the size of the plot. The distance between the bunds will depend upon the selected species of bamboo and planting of seedlings, rhizomes or culm cutting, etc. The bunds are prepared by digging trenches.

The bund and trench method has several advantages. Planting of bamboo seedlings/rhizomes etc., are done on the bund, which grow well because soil from the trench can be given around the bamboo clumps. The trenches can also be used for irrigation in dry season, if necessary. Infestation of diseases and pest on bamboo plantations also appear to be low due to proper drainage facilities provided by the trench during the rainy season. For commercial production of bamboo, the method of planting and the layout depend on the species and vigour of the bamboo. According to the situation of the land, more production can be aimed at even in a small area, which is to be kept in mind during adoption of layout. There should not be any competition among the bamboo clumps for food, light and water, etc., during the vegetative growth and maturation before harvesting. Methods of layout adopted for bamboo plantation are as follows:

**Square System:**

In this case bamboo is planted on each corner of the square area wherever the planting may be. In this system, the distance from plant to plant and row to row is equal. Intercropping and cultivation of short duration crops is possible in two directions of interspaces.

**Rectangular System:**

Bamboo is planted in each corner of a rectangular area but in this system distance between bamboo clump to clump is more than the distance from row to row.
Diagonal System:

This has been derived from the square system by planting an additional bamboo plant in the centre of the square. The central bamboo clump should be short term and small size for additional income.

![Diagonal Method]

Triangular System:

In this system bamboo clumps are raised in three corners. For commercial purpose, this system is very much useful to produce bamboo shoot.

![Triangle Method]

Hexagonal System:

In this method, bamboo clumps are planted in each corner of an equilateral triangular area. In this way, six bamboo clumps are planted from a hexagon with the seventh clump in the centre.

![Hexagonal Method]

Contour System:
In undulating hilly areas, bamboo clumps are planted across the slope in particular distance. In this process, soil erosion is retarded and this also facilitates water conservation.

Contour Method

Spacing:

Spacing for row to row and plant to plant depends on selected species of bamboo, size, growth rate of culm and structure of clump, fertility of soil and location of the bamboo plantation area. For conservation of soil or production of bamboo shoots, distance of 2.5 m X 2.5 m or 3 m X 3 m are adopted and 1600 or 1111 nos. of seedlings are planted per hectare.

For commercial cultivation of bamboo, the required distances are shown below:

<table>
<thead>
<tr>
<th>Name of bamboo species</th>
<th>Spacing (metre)</th>
<th>Nos. per hectare</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plant to Plant</td>
<td>Row to Row</td>
</tr>
<tr>
<td>Mirtinga / Rupai</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Pecha / Barak / Bari/Powra (Rhizome)</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Bari/Barak (Branch Cutting)/Muli / Makhal / Lathi ((Rhizome))</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Magar / Pecha</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Hati / Bhudum (Rhizome)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Muli (Seed)</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Kanak Kaich ((Rhizome)</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Bari/Barak (Branch Cutting)</td>
<td>4.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

Selection of Planting Material:

Various types of planting material according to the species are used for cultivation of bamboo. Rhizomes with 2 to 3 nos. of nodes of 1 to 2 years old bamboo culm are selected from bamboo clumps like Barak, Bari and Hati for plantation. The mother bamboo should be disease free during collection of rhizome with roots and soil. Bamboo cultivation with rhizome is an old
method practiced in the rural areas. Special care should be given during separation of the rhizome from the mother bamboo clump so that the buds remain fresh. Bordeaux paste (Copper sulphate: Lime: Water - 10: 10: 100) or coal tar are to be pasted on the cut portion of the mother plant. Rhizomes with roots are to be treated with the mixture of 1 gm Carbendazim 50% WP and 1 litre of water. Ripened and matured bamboo seeds are also used as a planting material for cultivation of bamboo. Seedlings from bamboo seeds are directly used for bamboo cultivation. During the flowering cycle year, seeds from bamboo like Kanta, Lathi, Pecha, Mritingha and Muli, etc., are collected and placed in poly bags for seedlings and used in the main field. Nowadays, for quick expansion of bamboo cultivation seedlings from culm cutting, ground layering, air layer, stump layering, seedling layering and tissue culture plantlets are produced.

**Nutrient Management:**

Nitrogen, Phosphorus and Potash nutrients are necessary for vegetative growth and better production. The above nutrients are used in the ratio of 3:2:1 or 4:2:1. Moreover, before use of inorganic fertilizers, soil testing should be done for actual requirement of fertilizers. Nitrogen, Phosphorus and Potash are available in rotten cow dung, compost, green manure, vermicompost and night soil, etc., and are also available from inorganic fertilizers like Urea, Ammonium Sulphate, Calcium, Ammonium Nitrate, Superphosphate, Rock Phosphate, Murite of potash, Potassium Sulphate, etc. Application of 5 kg compost or cow dung and ash, 100 gm urea, 100 gm rock phosphate and 50 gm murite of potash are to be applied in each pit before planting the seedling. Top dressing with 325 gm urea is to be done in trenches around the bamboo clumps after two months of planting of seedling or before 1-1.5 months of sprouting of bamboo shoots. It is to be kept in mind that the inorganic fertilizers should in no case come in direct contact with the rhizomes, buds and sprouting shoots, otherwise the new shoots will die if they come in contact with the fertilizers. Irrigation should be done in the trench if there is no rain. Chappy paddy or husk may be applied on the base of the bamboo clumps for maximum sprouting of bamboo shoots, increase of vegetative growth and production.

**Care and Management of Bamboo:**

After planting of seedlings in the main field, inter-cultural operation, care and management is most important specially intercropping, weed management, soil loosening around the clump, mulching, pruning of unwanted branches, maintaining healthy environment in bamboo plantation,
cutting of diseased, weak and abnormal bamboo, marking age of bamboo and timely harvesting of bamboo, etc.

**Intercropping:**

Intercropping between the spaces of bamboo plantation is profitable. Between the spaces of bamboo rows, Diaschoria can be grown depending upon the position of land, soil structure and species of bamboo. Short-term horticultural crops like Pineapple, Banana, Papaya and Lime can be grown in between the rows before planting of bamboo in the soil in new bamboo plantation; and vegetables like Ladiesfinger, Brinjal, Chilly, Amaranthus, Sweet gourd and Colocassia, etc., pulses and oil seeds like Arhar, Moong, Blackgram, Ground nut, Soyabean, etc., and Agri-crops like upland Paddy, Maize, Mesta, etc., can also be grown as intercrops in between the rows of bamboo. These types of intercrops should not be sown in close contact with the bamboo roots. Intercropping in bamboo plantation also help to control weeds.

After establishment of bamboo clumps in plantation area, spices like Ginger and Turmeric or medicinal plants like Sarpagandha Pupil, Gulancha, Shatamuli, Kulekhara and Harjora, etc., also can be profitably cultivated in the shade of the bamboos.

**Weed Control:**

Weeds grow more during the 1st year or so in the planting area. It is easy to manage the weeds if intercropping is provided in the interspaces of rows. Dry bamboo leaves fall off in the soil and cover the weeds and thus suppress them. Sometimes creeper like weeds cover the bamboo culms and its branches, leaves, etc., resulting in reduction of vegetative growth. By cutting the lower stem, this type of weeds can be controlled easily.

**Soil loosening around the clump:**

Spading the soil around the base of the bamboo clumps make the soil loose thus inducing healthy rhizome clump. Two times spading is needed before and after the rainy season and the spading should be done about 45 cm away from the clumps and for 15 cm depth.

**Destruction of diseased, pest-infested fallen leaves and mounding at the base of the clump:**
Diseased and pest infested dry leaves are to be collected and burnt in the months of December and January. This will prevent disease, and infestation by insects will also be controlled. Afterwards, loose soil is poured at the base of the bamboo clumps in the month of March which helps the vigorous growth of underground rhizome and culm.

**Mulching:**

At present bamboos are cultivated in rainfed condition. During the dry period, transpiration from stomata of leaves of the bamboo plant and evaporation from the soil takes place. Due to less moisture in the soil, maximum numbers of leaves fall. They cover the base of the bamboo clump and act as a mulching material, which further helps in conserving of the moisture content in the soil. Afterward, mulching materials get converted into organic manure which help in supply of nutrients to the bamboos, and improve structure and texture of the soil and also increase its water holding capacity.

**Pruning the unwanted branches:**

Some species of bamboo have huge branches and twigs. Bamboo clumps remain in close contact due to the presence of huge number of branch and twigs at the base level of the bamboo. As a result, bamboo shoots cannot come out from the soil in a straight manner and the result is abnormal bamboo culms. Harvesting of those culms become troublesome and fetch less market value. For creating healthy environment, unwanted branch and twigs should be pruned in the month of November-December, otherwise abnormal culms and disease and pest infestation will be more.

**Maintaining healthy environment in bamboo plantation:**

After two years of bamboo planting or at the 3rd year, structure of bamboo clumps appear to take shape. At that time sprouting of new shoots begins around the bamboo clumps and bamboo clumps begin to grow speedily. During the 2nd week of January or 1st week of April, pest and disease infested bamboo should be discarded from the clumps for maintaining the healthy environment in bamboo plantation. Sometimes some unwanted dry bamboos catch fire due to continuous friction between the dry bamboos. When the climate remains dry and hot, along with high wind velocity, fire spreads
quickly all over the plantation area and ultimately damage the bamboo plantation.

During this period, fireline around the plantation area should be maintained to check the incidence of fire. In the month of June-July, rain water remains stagnant for long, resulting in the leaves of bamboo plantation turning yellow and drying and falling, and ultimately the culms drying up. Hence the drainage system should be properly maintained by removing debris from the trench. Proper sanitation and clean and healthy environment should be maintained in the bamboo plantation.

**Cutting of weak and abnormal bamboos:**

If adequate care and management is not undertaken in time, the bamboo clumps become dry, and weak with the result that the bamboo clump gradually die. So the matured and ripened bamboo culm should be harvested in time. Abnormal branches and twigs should be discarded from the clumps in the month of March.

![Hati Bamboo of North-east Region.](image)

**Marking age of Bamboo:**

At present harvesting and identification of well-matured bamboo culm is done by the bamboo growers from their own experience. This method is not at all scientific for harvesting of bamboo culms. Sometimes, several aged bamboo culms are harvested according to necessity for different purposes.
For the purpose of particular works with bamboo and harvesting of appropriately aged bamboo, cultivation of bamboo should be done scientifically by marking the age on culms. Generally, the quality of bamboo deteriorates after it is about five years old. Every year, different permanent colours are to be marked on the lower portion of the culm for identification of age. One colour may be selected for a particular year like red, blue, yellow, or black for proper identification of age. So the number of colours will indicate the age of the bamboo culm, which can then be easily harvested according to necessity.

**Timely harvesting of Bamboo:**

Quality of bamboo will deteriorate if harvesting is done after the age of five years. Bamboos over five years old will be weak and breakable. Harvesting of culm every year will induce the emergence of new shoots and ensure healthy culm production. For commercial purpose, harvesting of bamboo can begin from the 3rd year of plantation although the culm will be fully mature after the fourth year. Quality of bamboo culm depends upon the quality of Carbohydrate present at the harvesting time. High quality of Carbohydrate makes the culm susceptible to fungal infection, and infestation of insect pest like Ghoon borer and Termite etc. Generally high quantity of carbohydrate is present during the rainy season and new shoots also emerge at that time. During Autumn and Winter season, carbohydrate quantum is low in bamboo culm. So harvesting needs to be done in Autumn and Winter season. Matured culm should be harvested one or two nodes above the ground level to avoid damage to underground eyes of the rhizome. Slanted cut should be given with sharp tools to avoid cracking and deposition of water at the cut end of the ground culm.

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Two Tough Questions…*

Question 1:
If you knew a woman who was pregnant, who had 8 kids already, three who were deaf, two who were blind, one mentally retarded, and she had syphilis, would you recommend that she have an abortion?

Read the next question before looking at the response for this one.

Question 2:
It is time to elect a new world leader, and only your vote counts.
Here are the facts about the three candidates.

Candidate A. Associates with crooked politicians, and consults with astrologists. He’s had two mistresses. He also chain smokes and drinks 8 to 10 martinis a day.

Candidate B. He was kicked out of office twice, sleeps until noon, used opium in college and drinks a quart of whiskey every evening.

Candidate C. He is a decorated war hero. He’s a vegetarian, doesn’t smoke, drinks an occasional beer and never cheated on his wife.

Which of these candidates would be your choice?
Decide first… no peeking, and then scroll down for the response.

Candidate A is Franklin D. Roosevelt.
Candidate B is Winston Churchill.
Candidate C is Adolph Hitler.

And, by the way, on your answer to the abortion question:

If you said YES …

…. you just killed Beethoven - Gr8 musician

Pretty interesting isn’t it? Makes a person think before judging someone!

*Received by e-mail from vipul khagram (vipul_khagram@hotmail.com) on Nov 16, 2009.*